TE0803 Test Board

Revision: v.18
Date: 06.05.2019 16:00

Table of Contents

Online version of this manual and other related documents can be found at https://wiki.trenz-electronic.de/display/PD/Trenz+Electronic+Documentation

Overview

Design Example with minimum PS Setup (DDR, QSPI, UART0) only for custom boards or easier debug via SDK.

Key Features

- QSPI
- SDK
- Custom Carrier (minimum PS Design with available module components only)
- Special FSBL for QSPI Programming

Revision History

Date	Vivado	Project Built	Authors	Description
2018-05-17	2017.4	TE0803-test_board_noprebuilt-vivado_2017.4-build_09_20180517152118.zip TE0803-test_board-vivado_2017.4-build_09_20180517152103.zip	John Hartfiel	• new assembly variant
2018-04-11	2017.4	TE0803-test_board_noprebuilt-vivado_2017.4-build_07_20180411081821.zip TE0803-test_board-vivado_2017.4-build_07_20180411081757.zip	John Hartfiel	• bugfix TE0803-01-04EG boart part file
2018-02-13	2017.4	TE0803-test_board_noprebuilt-vivado_2017.4-build_06_20180213120257.zip TE0803-test_board-vivado_2017.4-build_06_20180213120229.zip	John Hartfiel	• new assembly variant
2018-02-05	2017.4	TE0803-test_board-vivado_2017.4-build_05_20180205101915.zip TE0803-test_board_noprebuilt-vivado_2017.4-build_05_20180205101943.zip	John Hartfiel	• new assembly variant
2018-01-31	2017.4	TE0803-test_board-vivado_2017.4-build_05_20180131124202.zip TE0803-test_board_noprebuilt-vivado_2017.4-build_05_20180131124215.zip	John Hartfiel	• new assembly variant
2018-01-18	2017.4	TE0803-test_board-vivado_2017.4-build_05_20180118160549.zip TE0803-test_board_noprebuilt-vivado_2017.4-build_05_20180118160604.zip	John Hartfiel	• rework Board Part Files
2017-11-16	2017.2	TE0803-test_board-vivado_2017.2-build_05_20171116152716.zip TE0803-test_board_noprebuilt-vivado_2017.2-build_05_20171116154619.zip	John Hartfiel	• Update Board Part CSV File with new Flash assembly variants
2017-11-14	2017.2	TE0803-test_board-vivado_2017.2-build_05_20171114090712.zip TE0803-test_board_noprebuilt-vivado_2017.2-build_05_20171114090725.zip	John Hartfiel	• Initial release

Release Notes and Know Issues

Issues	Description	Workaround	To be fixed version
No known issues	---	---	---

Requirements

Software

Software	Version	Note
Vivado	2017.4	needed
SDK	2017.4	needed

Hardware

Basic description of TE Board Part Files is available on TE Board Part Files.

Complete List is available on <design name>/board_files/*_board_files.csv

Design supports following modules:

Module Model	Board Part Short Name	PCB Revision Support	DDR	QSPI Flash	Others	Notes
TE0803-ES1	es1	REV01	2GB	64MB		
TE0803-01-02EG-1E	2eg	REV01	2GB	64MB		
TE0803-01-02CG-1E	2cg	REV01	2GB	64MB		
TE0803-01-03EG-1E	3eg	REV01	2GB	64MB		
TE0803-01-03CG-1E	3cg	REV01	2GB	64MB		
TE0803-01-02EG-1EA	2eg	REV01	2GB	128MB		
TE0803-01-02CG-1EA	2cg	REV01	2GB	128MB		
TE0803-01-03EG-1EA	3eg	REV01	2GB	128MB		
TE0803-01-03EG-1EB	3egb	REV01	4GB	128MB		
TE0803-01-03CG-1EA	3cg	REV01	2GB	128MB		

Module Model	Board Part Short Name	PCB Revision Support	DDR	QSPI Flash	Others	Notes
TE0803-01-04CG-1EA	4cg	REV01	2GB	128MB		
TE0803-01-04EV-1EA	4ev	REV01	2GB	128MB		
TE0803-01-04EV-1E3	4ev	REV01	2GB	128MB	1mm connector contribution to stacking height	
TE0803-01-04EG-1EA	4eg	REV01	2GB	128MB		
TE0803-01-04CG-1EB	4cg	REV01	2GB	256MB		
TE0803-01-05EV-1EA	5ev	REV01	2GB	128MB		
TE0803-01-05EV-1IA	5ev_i	REV01	2GB	128MB		

Note: Design contains also Board Part Files for TE0803+TEBF0808 configuration, this boart part files are not used for this reference design. * Only different Flash size.

Design supports following carriers:

Carrier Model	Notes
Custom PCB	use simple Board Part files, if MIO connected is different to TEBF0808
TEBF0808	Used as reference carrier.
TEBT0808	Change UART0 to UART1 (MIO68...69) and regenerate design

Additional HW Requirements:

Additional Hardware	Notes

Content

For general structure and of the reference design, see Project Delivery

Design Sources

Type	Location	Notes
Vivado	<design name>/block_design <design name>/constraints <design name>/ip_lib	Vivado Project will be generated by TE Scripts
SDK/HSI	<design name>/sw_lib	Additional Software Template for SDK/HSI and apps_list.csv with settings for HSI

Additional Sources

Type	Location	Notes

Prebuilt

File	File-Extension	Description
BIF-File	*.bif	File with description to generate Bin-File
BIN-File	*.bin	Flash Configuration File with Boot-Image (Zynq-FPGAs)
BIT-File	*.bit	FPGA (PL Part) Configuration File
Diverse Reports	---	Report files in different formats
Hardware-Platform-Specification-Files	*.hdf	Exported Vivado Hardware Specification for SDK/HSI and PetaLinux
LabTools Project-File	*.lpr	Vivado Labtools Project File
Software-Application-File	*.elf	Software Application for Zynq or MicroBlaze Processor Systems

Download

Reference Design is only usable with the specified Vivado/SDK/PetaLinux/SDx version. Do never use different Versions of Xilinx Software for the same Project.

Reference Design is available on:

- TE0803 "Test Board" Reference Design

Design Flow

⚠ Reference Design is available with and without prebuilt files. It's recommended to use TE prebuilt files for first lunch.

Trenz Electronic provides a tcl based built environment based on Xilinx Design Flow.

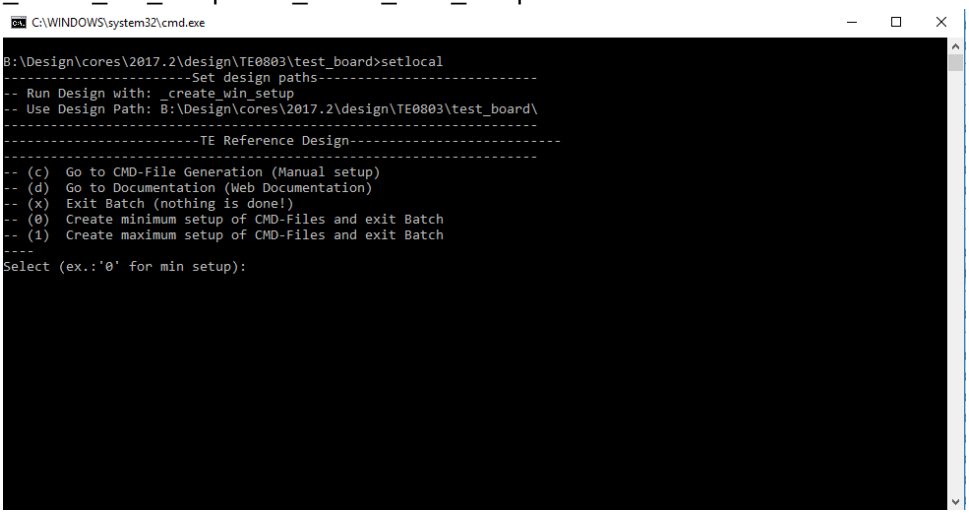
See also:

- Vivado/SDK/SDSoC#XilinxSoftware-BasicUserGuides
- Vivado Projects
- Project Delivery.

The Trenz Electronic FPGA Reference Designs are TCL-script based project. Command files for execution will be generated with "_create_win_setup.cmd" on Windows OS and "_create_linux_setup.sh" on Linux OS.

TE Scripts are only needed to generate the vivado project, all other additional steps are optional and can also executed by Xilinx Vivado/SDK GUI. For currently Scripts limitations on Win and Linux OS see: Project Delivery Currently limitations of functionality

1. _create_win_setup.cmd/_create_linux_setup.sh and follow instructions on shell:



2. Press 0 and enter for minimum setup
3. (optional Win OS) Generate Virtual Drive or use short directory for the reference design (for example x:\<design name>)
4. Create Project
    a. Select correct device and Xilinx install path on "design_basic_settings.cmd" and create Vivado project with "vivado_create_project_guimode.cmd"
    Note: Select correct one, see TE Board Part Files
    Important: Use Board Part Files, which **did not** ends with *_tebf0808
5. Create HDF and export to prebuilt folder

a. Run on Vivado TCL: TE::hw_build_design -export_prebuilt
   Note: Script generate design and export files into \prebuilt\hardware\<short dir>. Use GUI is the same, except file export to prebuilt folder

6. Generate Programming Files with HSI/SDK
   a. Run on Vivado TCL: TE::sw_run_hsi
      Note: Scripts generate applications and bootable files, which are defined in "sw_lib\apps_list.csv"
   b. (alternative) Start SDK with Vivado GUI or start with TE Scripts on Vivado TCL: TE::sw_run_sdk
      Note: See SDK Projects

Launch

Programming

⚠ Check Module and Carrier TRMs for proper HW configuration before you try any design.

Xilinx documentation for programming and debugging: Vivado/SDK/SDSoC-Xilinx Software Programming and Debugging

QSPI

1. Connect JTAG and power on carrier with module
2. Open Vivado Project with "vivado_open_existing_project_guimode.cmd" or if not created, create with "vivado_create_project_guimode.cmd"
3. Type on Vivado TCL Console: TE::pr_program_flash_binfile -swapp hello_te0808
   Note: To program with SDK/Vivado GUI, use special FSBL (zynqmp_fsbl_flash) on setup

Use SDK instead of Vivado is also possible, see: SDK Projects#Xilinx%22HelloWorld%22onZynqMP

SD

This does not work, because SD controller is not selected on PS.

JTAG

Load configuration and Application with SDK Debugger into device, see:

- SDK Projects
- SDK Projects#DebugSoftwareApplication

Usage

QSPI Boot:

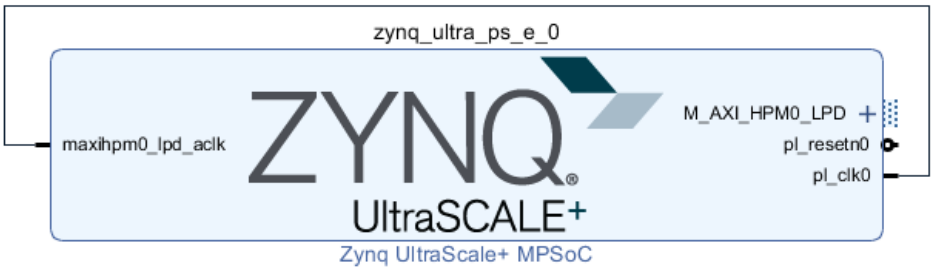
1. Prepare HW like described on section 46039162
2. Connect UART USB (most cases same as JTAG)
3. Select QSPI Card as Boot Mode
   Note: See TRM of the Carrier, which is used.
4. Power On PCB
   Note: 1. ZynqMP Boot ROM loads PMU Firmware and FSBL from QSPI into OCM, 2. FSBL loads Application into DDR

Debugging:

- SDK Projects
- SDK Projects#DebugSoftwareApplication

System Design - Vivado

Block Design



PS Interfaces

Activated interfaces:

Type	Note
DDR	
QSPI	MIO
UART0	MIO, please select other one, if you have connected uart to second controller or other MIO
SWDT0..1	
TTC0..3	

Constrains

Basic module constrains

_i_bitgen.xdc

```
set_property BITSTREAM.GENERAL.COMPRESS TRUE [current_design]
set_property BITSTREAM.CONFIG.UNUSEDPIN PULLNONE [current_design]
```

Design specific constrain

Not needed.

Software Design - SDK/HSI

For SDK project creation, follow instructions from:

SDK Projects

Application

zynqmp_fsbl

Xilinx default FSBL

zynqmp_fsbl_flash

TE modified 2017.4 FSBL

Changes:

- Set FSBL Boot Mode to JTAG
- Disable Memory initialisation

Hello TE0803

Hello TE0803 is a Xilinx Hello World example as endless loop instead of one console output.

Additional Software

No additional software is needed.

Appx. A: Change History and Legal Notices

Document Change History

To get content of older revision got to "Change History" of this page and select older document revision number.

Date	Document Revision	Authors	Description
2018-10-26	v.18 Unbekanntes Makro: 'metadata'	John Hartfiel	• new assembly variant
11.04.2018	v.13	John Hartfiel	• bugfix boart part file
03.04.2018	v.11	John Hartfiel	• new assembly variant
2018-01-18	v.6	John Hartfiel	• Release 2017.4
2017-11-16	v.4	John Hartfiel	• Update assembly versions with new Flash size
2017-11-14	v.3	John Hartfiel	• Release 2017.2
	All	John Hartfiel , Thorsten Trenz	

Legal Notices

Data privacy

Please also note our data protection declaration at https://www.trenz-electronic.de/en/Data-protection-Privacy

Document Warranty

The material contained in this document is provided “as is” and is subject to being changed at any time without notice. Trenz Electronic does not warrant the accuracy and completeness of the materials in this document. Further, to the maximum extent permitted by applicable law, Trenz Electronic disclaims all warranties, either express or implied, with regard to this document and any information contained herein, including but not limited to the implied warranties of merchantability, fitness for a particular purpose or non infringement of intellectual property. Trenz Electronic shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein.

Limitation of Liability

In no event will Trenz Electronic, its suppliers, or other third parties mentioned in this document be liable for any damages whatsoever (including, without limitation, those resulting from lost profits, lost data or business interruption) arising out of the use, inability to use, or the results of use of this document, any documents linked to this document, or the materials or information contained at any or all such documents. If your use of the materials or information from this document results in the need for servicing, repair or correction of equipment or data, you assume all costs thereof.

Copyright Notice

Technology Licenses

The hardware / firmware / software described in this document are furnished under a license and may be used /modified / copied only in accordance with the terms of such license.

Environmental Protection

To confront directly with the responsibility toward the environment, the global community and eventually also oneself. Such a resolution should be integral part not only of everybody's life. Also enterprises shall be conscious of their social responsibility and contribute to the preservation of our common living space. That is why Trenz Electronic invests in the protection of our Environment.

REACH, RoHS and WEEE

REACH

Trenz Electronic is a manufacturer and a distributor of electronic products. It is therefore a so called downstream user in the sense of REACH. The products we supply to you are solely non-chemical products (goods). Moreover and under normal and reasonably foreseeable circumstances of application, the goods supplied to you shall not release any substance. For that, Trenz Electronic is obliged to neither register nor to provide safety data sheet. According to present knowledge and to best of our knowledge, no SVHC (Substances of Very High Concern) on the Candidate List are contained in our products. Furthermore, we will immediately and unsolicited inform our customers in compliance with REACH - Article 33 if any substance present in our goods (above a concentration of 0,1 % weight by weight) will be classified as SVHC by the European Chemicals Agency (ECHA).

RoHS

Trenz Electronic GmbH herewith declares that all its products are developed, manufactured and distributed RoHS compliant.

WEEE

Information for users within the European Union in accordance with Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE).

Users of electrical and electronic equipment in private households are required not to dispose of waste electrical and electronic equipment as unsorted municipal waste and to collect such waste electrical and electronic equipment separately. By the 13 August 2005, Member States shall have ensured that systems are set up allowing final holders and distributors to return waste electrical and electronic equipment at least free of charge. Member States shall ensure the availability and accessibility of the necessary collection facilities. Separate collection is the precondition to ensure specific treatment and recycling of waste electrical and electronic equipment and is necessary to achieve the chosen level of protection of human health and the environment in the European Union. Consumers have to actively contribute to the success of such collection and the return of waste electrical and electronic equipment. Presence of hazardous substances in electrical and electronic equipment results in potential effects on the environment and human health. The symbol consisting of the crossed-out wheeled bin indicates separate collection for waste electrical and electronic equipment.

Trenz Electronic is registered under WEEE-Reg.-Nr. DE97922676.

2018-09-18